ATTENTION DEFICIT HYPERACTIVITY DISORDER

Introduction

Attention Deficit Hyperactivity Disorder (ADHD) is one of several childhood disorders brought into the public arena in recent years. ADHD is the current term for a specific developmental disorder describing specific behavioral difficulties. ADHD is characterized by multiple symptoms of persistent and dysfunctional patterns of overactivity, impulsiveness, inattention, and distractibility (Murphy et al., 2001). A survey conducted of a nationally representative sample of 8- to 15-year-old children in the United States found that close to nine percent met the *Diagnostic and Statistical Manual of Mental Disorders*, *Fourth Edition* (*DSM-IV*) criteria for ADHD (Froehlich, as cited by Busko, 2007). Among children meeting the criteria, only 47% had been diagnosed and only 32% were receiving treatment (Froehlich, as cited by Busko). Table 1 outlines additional facts about ADHD.

Table 1

Facts about Attention Deficit Hyperactivity Disorder

- ADHD affects an estimated 4.1% of youths age 9 to 17 in a six-month period.
- About 2 to 3 times more boys than girls have ADHD.
- Children with untreated ADHD have higher than normal rates of injury.
- ADHD often co-occurs with other problems, such as depressive and anxiety disorders, conduct disorder, drug abuse, or antisocial behavior.
- Symptoms of ADHD usually become evident in preschool or early elementary years.
- The disorder frequently persists into adolescence and into adulthood.
- Treatment may be required throughout life.

Source: National Institute of Mental Health (NIMH), 2000.

Children with ADHD experience harmful consequences because of their behavior. They frequently experience peer rejection and academic and social difficulties which may have long-term effects. According to the National Institute of Mental Health (NIMH), these children may have conduct disorders, experience drug abuse, exhibit antisocial behavior, and incur injuries of all sorts. For many individuals, the impact of ADHD continues into adulthood (NIMH, 2000).

ADHD has been given numerous names since it was first documented. Some of these names include Minimal Brain Dysfunction, Hyperkinetic Reaction of Childhood, and Attention-Deficit Disorder With or Without Hyperactivity (Children and Adults with Attention Deficit Disorders [CHADD], 2001). With the *Diagnostic and Statistical Manual, Fourth Edition (DSM-IV)* classification system, the disorder has been renamed Attention Deficit Hyperactivity Disorder. The current name reflects the importance of the inattention characteristics of the disorder, as well as hyperactivity and impulsivity (CHADD).

There are three subtypes of ADHD, which are recognized by professionals: predominately hyperactive-impulsive type, predominantly inattentive type, and the combined type (NIMH, 2003). Predominantly hyperactive-impulsive type of ADHD exists when the child or adolescent does not show significant inattention (NIMH). Predominantly inattentive type is based on the child's not showing signs of significant hyperactive-impulsive behavior (NIMH). Predominantly inattentive type is sometimes referred to as ADD, which is an outdated term for the disorder (NIMH). A child with combined type of ADHD displays both hyperactive-impulse and inattentive symptoms (NIMH). This combined type of ADHD is the most common form (Kids Health, 2005). Table 2 outlines the symptoms exhibited by each type.

Table 2

Symptoms of ADHD

Signs of Hyperactive-impulsivity
- Feeling restless, fidgeting with hands and feet, cannot sit still
- Running, climbing or restlessness when quiet behavior is appropriate
- Blurting answers before hearing the entire question
- Difficult time taking turns or waiting in line

Signs of Inattention
- Easily distracted by sights and sounds
- Does not pay attention to details and makes careless mistakes
- Rarely follows directions
- Easily loses or forgets things
- Skips from one unfinished task to another

Signs of Combined Type
- Symptoms of hyperactive impulsivity and inattention are both present

Source: National Institute of Mental Health (NIMH), 2003.

Causes and Risk Factors

ADHD is one of the best-researched disorders in medicine. Studies over the past 20 years involving twins, adoptions, and molecular investigations have revealed that there is a genetic basis for the disorder (MediFocus, 2002). Recent imaging studies have documented the factual etiology of ADHD within specific areas of the brain.

Since ADHD runs in families, inheritance appears to be an important factor. Families with a child diagnosed with ADHD are more likely than those without ADHD offspring to have family members with the disorder. The heritability of ADHD averages approximately 80%, rivaling the heritability factor for the trait of height (Barkley, 2001). Several other developmental

characteristics are associated with ADHD. Perinatal injury, malnutrition, and substance exposure have also been linked to ADHD (Murphy et al., 2001).

A recent brain imaging study has pinpointed where the brains of children with ADHD are different from children who do not have the disorder (Boyles, 2003). This new research can potentially lead to better drugs, as well as behavioral interventions, for children with ADHD (Boyles). Brain imaging has the potential to allow clinicians to better utilize current therapies used for treatment (Boyles).

A recent study conducted by the National Institute of Mental Health (NIMH) found that ADHD was linked to changes in production of the brain's chemical dopamine (2007). NIMH researchers found that ADHD likely originated from several such genes, as well as other non-genetic factors (NIHM). Evidence from several previous studies led scientists to suspect involvement of a gene that codes for a receptor protein, which binds to the brain's chemical messenger dopamine. Children possessing a variant of this gene had an increased risk of having ADHD, but this gene variant could also improve long-term outcomes of the child (NIMH). The report indicated that this version of the dopamine D4 receptor gene, called the 7-repeat variant, accounted for about 30% of the genetic risk for ADHD, making it by far the strongest candidate gene implicated in the disorder (NIMH). Traits linked to the 7-repeat version may include novelty-seeking and impulsiveness (NIMH). Researchers are following up with studies on the relationship between cortex thickness and the cognitive features present in ADHD (NIMH).

Although a diagnostic test for ADHD is not available, there is insurmountable evidence supporting the validity of the disorder (CHADD, 2001). A recent study determined that the process of ADHD diagnosis in the United States takes approximately one year (Reuters, Attention Disorder Diagnosis Often Delayed, Survey Shows, 2004). Diagnosing ADHD early can help to prevent long-term effects in adulthood (Reuters).

Comorbidity

According to the NIMH (2000), ADHD is not usually an isolated disorder and comorbidities may complicate research studies. Specifically, ADHD can occur with learning disabilities (15-25%), language disorders (30-35%), conduct disorder (15-20%), oppositional defiant disorder (up to 40%), mood disorders (15-20%), and anxiety disorders (20-25%). Up to 60% of children with tic disorders also have ADHD.

Difficulties with memory, cognitive processing, sequencing, motor skills, social skills, modulation of emotional response, and response to discipline are commonly associated with ADHD (NIMH, 2000). Sleep disorders are also more prevalent in children who suffer from ADHD.

There may be a causal relationship between ADHD and seizures (Reuters, ADHD is a Risk Factor for Unprovoked Seizures in Children, 2004). Children diagnosed with ADHD have an increased chance (by 2.5%) of experiencing unprovoked seizures (Reuters).

Diagnosis

Some parents notice inattention, hyperactivity and impulsivity in their child before they are school age, although these symptoms may go unnoticed until the child runs into problems at school (NIMH, 2003). Diagnosis of ADHD should be made by a professional with training in ADHD or in the diagnosis of mental disorders (NIMH). Those most often trained in diagnosing ADHD include

child psychiatrists, psychologists, developmental/behavioral pediatricians, behavioral neurologists and, in some cases, clinical social workers (NIMH).

Before diagnosing a child with ADHD, a specialist needs to first rule out other potential reasons for the child's behavior. ADHD-like behavior may be the result of a sudden change in the child's life, undetected seizures, a middle ear infection that causes hearing problems, medical disorders that affect brain functioning, learning disability, anxiety, or depression (NIMH, 2003). In instances of disruptive behavior, it is critical that the clinician determine if the disruptive behavior is the primary diagnosis or if it is secondary to ADHD (American Academy of Child & Adolescent Psychiatry [AACAP], 1994). If ADHD is the primary cause, it must be diagnosed and treated so the secondary disruptive behavioral disorder can also be successfully addressed (AACAP).

The child should be evaluated by the professional for social adjustment and mental health through interviews of the child's teachers, parents, coaches and/or babysitters (NIMH, 2003). Tests on intelligence and learning achievement may be given to rule out a learning disability (NIMH). A correct diagnosis of ADHD often resolves confusion surrounding the child's problems.

Treatments

There is no treatment available to cure this disorder, but many treatments are available that effectively assist with its management. A wide variety of treatments have been used to treat ADHD. Foremost is education of the family and school staff about ADHD and its management.

Among the treatments that result in the greatest degree of improvement in the symptoms, research strongly supports the use of stimulant medications. Methylphenidate (MPH) is the first-line agent, followed by d-amphetamine (Murphy et al., 2001).

Studies on the efficacy of medication and psychosocial treatments for ADHD support the effectiveness of the combination of stimulants and psychosocial treatments for ADHD. Greater improvements have been noted when stimulants were combined with behavior therapy (Society of Clinical Child and Adolescent Psychology, 2006). Studies have indicated the superiority of stimulants when they are compared to psychosocial treatments (NIMH, 2000). However, the combination of stimulants and behavioral treatments did result in improved social skills and, accordingly, parents and teachers judged this treatment more favorably.

A Consensus Statement published by NIMH (1998) maintains that psychosocial treatment for ADHD has included a number of behavioral strategies such as contingency management (e.g., point/token reward systems, and timeout) that typically are conducted in the classroom, parent training (where the parent is taught child management skills), clinical behavior therapy (parent, teacher, or both are taught to use contingency management procedures), and cognitive-behavioral treatment, e.g., self-monitoring, verbal self-instruction, problem-solving strategies, self-reinforcement. Clinical behavior therapy, parent training, and contingency management have also produced beneficial effects. Intensive direct interventions in children with ADHD have produced improvements in key areas of functioning. However, no studies have been conducted on some of these intensive interventions or on how these interventions work with medications prescribed for ADHD.

Treatment of ADHD requires behavioral, psychological, and education components. Education of the child and family regarding the nature of the disorder and the methods proven to manage the disorder is crucial in its management. Treatment must be provided over long periods to assist those with ADHD in the ongoing management of their disorder.

Psychosocial Treatments

Studies comparing stimulants with psychosocial treatment consistently reported greater efficacy of stimulants (NIMH, 2000). However, several psychosocial treatments do possess good levels of support in the treatment of ADHD. The information in the following paragraph is attributed to the Society of Clinical Child and Adolescent Psychology (2006). One such treatment is behavioral parent training (BPT). BPT teaches parents behavior modification techniques based on social learning principles. Parents are encouraged to provide clear rules and structure in the child's environment. Positive and negative consequences for corresponding child behavior are also encouraged. BPT has been shown to be effective in improving problematic child behavior and negative parent-child interactions.

A number of different strategies also have good levels of support regarding treatment outcomes. These include contingency management (e.g., point/token reward systems, timeout, response cost) that typically is conducted in the classroom, biofeedback, physical exercise, relaxation and physical exercise, and self-verbalization (Chorpita & Daleiden, 2007). These treatment modalities have produced beneficial effects. Further study on these interventions is continuing.

Pharmacological Treatment

The following is based on information from the National Institute of Health (1998). Stimulants are generally considered to be first line treatment for ADHD and are often prescribed by pediatricians, family physicians, specialized psychiatrists or child psychiatrists. Stimulant medications are very effective at reducing ADHD symptoms in the short-term. Past studies have found that a significant majority of children with ADHD benefit from stimulant medication (Society of Clinical Child and Adolescent Psychology, 2006).

Short-term trials of stimulants have supported the effectiveness of MPH. Few differences have been found among these stimulants. However, MPH is the most studied and the most often used of the stimulants. For a variety of reasons, including side effects, incomplete responses or other circumstances, other medications are often recommended in combination with or following unsuccessful trials of stimulants.

Recently the U.S. Food and Drug Administration (FDA) approved a medication for use in treating ADHD that is not a stimulant (NIMH, 2003). This medication, an atomoxetine, works on the neurotransmitter norepinephrine, as opposed to dopamine, which is what stimulants influence (NIMH). More research is needed to compare the atomoxetine to already available medications, but preliminary evidence suggests that children with ADHD on an atomoxetine exhibit significant improvement in their symptoms (NIMH).

Trials have found beneficial effects on the defining symptoms of ADHD and associated aggressiveness for as long as medication is taken. However, stimulant treatments may not regulate the entire range of behavior problems, and children under treatment may still show a higher level of behavioral problems than children without ADHD. The findings also show that there is little improvement in academic achievement or social skills.

It is critical that all involved with the use of these powerful medications be clear about what the treatment targets are, so a particular medication can be maintained if it is successful and stopped if it is not.

Unproven Treatments

There is a long list of other interventions for the treatment of ADHD. These include dietary replacement, exclusion, or supplementation; various vitamin, mineral, or verbal regimens; and perceptual stimulation. Other treatment approaches that were tested and were found to have no support in recent studies include client centered therapy, self-control training, skill development, and the combination of parent management training and self-verbalization. However, it is important to note that some of these treatments may benefit the accompanying symptoms of ADHD, so further study is needed (Chorpita & Daleiden, 2007).

Anecdotal evidence abounds for the effects of diet on ADHD. Several foods are mentioned, particularly casein (from milk), but more recently gliadin (from wheat gluten) (Lilienfeld, 2005). There are studies that link ADHD to some food sensitivities. Some of the dietary elimination strategies showed intriguing results, suggesting the need for future research. One dietary study determined that food additives might have an impact on a child's hyperactivity level (Warner, 2004). Treatments that focus on mineral supplementation may merit further study, but current data suggests that they are only useful when true deficiency has been demonstrated. Although these treatments have generated considerable interest and there are some controlled and uncontrolled studies using various treatment strategies, the research regarding these interventions is disproportionate.

Other Important Treatment Elements

It is important to realize that simple inattention or hyperactivity by itself is not sufficient for diagnosis. ADHD has been misdiagnosed in both children and adults by parents, teachers, and even by patients themselves. Misbehavior by children or teens has been inappropriately diagnosed and treated by persons looking for a simple solution to personality difficulties, in hopes of avoiding psychotherapy.

While no treatment can cure ADHD, caregivers and parents must educate themselves about this disorder so they can understand it and design an effective treatment plan. It is up to the caregiver to become an informed consumer and learn to distinguish accurate information from the inaccurate. Relatives, teachers, and caretakers need to understand that ADHD is neurobiological and that a child's brain works a bit differently. ADHD is not the result of too much sugar or too little discipline.

Effective treatment involves the use of a multimodal approach that includes an appropriate educational program; behavior modification; parent, child and teacher education; and sometimes counseling and medication (CHADD, 2001). Caregivers need to advocate for their children in academic settings, as well as in their home environment. Children with ADHD may be eligible for special educational services in the public schools under both the Individuals with Disabilities in Education Act (IDEA: Public Law 101-476) and Section 504 of the Rehabilitation Act of 1973 (Public Law 93-112) (Barkley, 2001). IDEA governs special education requirements and Section 504 provides for reasonable accommodations for children with disabilities (Gephart, 2002). Maximizing positive outcomes under these laws is possible with caregiver involvement.

Effective parent training teaches strategies to modify behaviors and improve outcomes. Because ADHD is hereditary, many parents of children with ADHD discover, when their child is diagnosed, that they too have ADHD (CHADD, 2001). Parents with ADHD may need the same types of evaluation and treatment that they seek for their children.

Sources

American Academy of Child & Adolescent Psychiatry (AACAP). (1994). Attention-Deficit Hyperactivity/Disorder. *AACAP Information on Benefit Coverage*. [Online]. Available: http://www.aacap.org/clinical/beneadhd.htm. [July 2005].

Barkley, R. ADHD Fact Sheet. (2001).

Boyles, S. (2003). Brain Imaging Targets ADHD Differences. WebMD Health. [Online]. Available: http://my.webmd.com/content/article/77/95341.htm. [December 2003].

Busko, M. (2007). Study Finds Almost 9% of American Children Meet DSM-IV Criteria for ADHD. Medscape Medical News.

Children and Adults with Attention Deficit Disorders (CHADD). (2001). The Disorder Named AD/HD–CHADD Fact Sheet #1. 2001.

Chorpita, B., & Daleiden, E. (2007). 2007 Biennial Report: Effective Psychosocial Interventions for Youth with Behavioral and Emotional Needs. Child and Adolescent Mental Health Division, Hawaii Department of Health.

Gephart, H. (2002). Diagnosis and Treatment of ADHD: Professional Interview Series. [Online]. Available: http://www.athealth.com/Practitioner/HarlanGephartMD.html. [June 2005].

Kids Health. (2005). *What is ADHD?* [Online]. Available: http://www.kidshealth.org/parent/medical/learning/adhd.html. [January 2008].

Lilienfeld, S. (2005). Scientifically Unsupported and Supported Interventions for Childhood Psychopathology: A Summary. *Pediatrics*, *115 (3)*, 761-764.

MediFocus. (2002). *Attention Deficit Hyperactivity Disorder*. [Online]. Available: http://www.medifocus.com/guide_detail.asp?gid=PS001&a=a. [June 2002].

Murphy, M., Cowan, R., & Sederer, L. (2001). Disorders of Childhood and Adolescence. *Blueprints in Psychiatry, Second Edition*. Malden, Mass: Blackwell Science, Inc., 40-41.

National Institute of Health (NIH). (1998). Diagnosis and Treatment of Attention Deficit Hyperactivity Disorder. *NIH Consensus Statement Online*, *16*, 2*:* [Online]. Available: http://www.ncbi.nlm.nih.gov/books/bv.fcgi?rid=hstat4.chapter.19663. [January 2008].

National Institute of Mental Health (NIMH). (2007). Gene Predicts Better Outcome as Cortex Normalizes in Teens with ADHD. *Science Update*. [Online]. Available: http://www.nimh.nih.gov/science-news/2007/gene-predicts-better-outcome-as-cortex-normalizes-in-teens-with-adhd.shtml. [January 2008].

National Institute of Mental Health (NIMH). (2003). *Attention Deficit Hyperactivity Disorder. Questions and Answers.* [Online]. Available: http://www.nimh.nih.gov/publicat/adhd.cfm. [June 2005].

National Institute of Mental Health (NIMH). (2000). *Attention Deficit Hyperactivity Disorder. Questions and Answers*. [Online]. Available: http://www.nimh.nih.gov/publicat/adhdqa.cfm. [June 2002]. *Not available August 2005*.

National Institute of Mental Health (NIMH). (1998). *Diagnosis and Treatment of Attention Deficit Hyperactivity Disorder*. NIH Consensus Statement Online. [Online]. Available: http://www.healthyplace.com/communities/add/nimh/diagnosis_treatment.htm. [November 2002].

Reuters Health Information. (2004). *ADHD Is a Risk Factor for Unprovoked Seizures in Children*. [Online]. Available: http://www.medscape.com/viewarticle/484118_print. [November 2002]. *Not available August 2005.*

Reuters Health Information. (2004). *Attention Disorder Diagnosis Often Delayed, Survey Shows*. [Online]. Available: http://www.medscape.com/viewarticle/487992?src=mp. [November 2002]. *Not available August 2005*.

Society of Clinical Child and Adolescent Psychology. (2006). *Evidence-Based Treatment for Children and Adolescents.* American Psychological Association & the Network on Youth Mental Health. [Online]. Available: http://www.wjh.harvard.edu/~nock/Div53/EST/index.htm. [December 2007].

Warner, J. (2004). Food Additives May Affect Kids' Hyperactivity. *WebMD Health*. [Online]. Available: http://webmd.com/content/article/87/99567.htm. [November 2002]. *Not available August 2005.*

Additional Resources

Barkley, R. (1995). *Taking Charge of ADHD—The Complete Authoritative Guide for Parents.* New York: Guilford Press.

Clark, L. (1985). *SOS! Help for Parents—A Practical Guide for Handling Common Everyday Behavior Problems.* Bowling Green, KY: Parents Press.

Identifying and Treating Attention Deficit Hyperactivity Disorder: A Resource for School and Home, 2003. U.S. Office of Special Education Programs. http://www.pluk.org/Pubs/Fed/ADHDresource_2003_421K.pdf.

National Institution of Mental Health (NIMH). (2000). *Attention Deficit Hyperactivity Disorder. Questions and Answers.*

Suggested reading for parents recommended by CHADD

Barkley, R. (1998). *Attention Deficit Hyperactivity Disorders*: *A Handbook for Diagnosis and Treatment*. New York: Guilford Press.

Suggested reading for parents recommended by CHADD *(continued)*

Brown, T. (2000). *Attention-Deficit Disorders and Comorbidities in Children, Adolescents, and Adults.* Washington, DC: American Psychiatric Press, Inc.

Dendy, C. (1995). *Teenagers with ADD*. Bethesda, MD: Woodbine House.

Goldstein, S. (1999). The Facts about AD/HD: An Overview of Attention-Deficit Hyperactivity Disorder. *CHADD 1999 Conference Book*, Landover, MD: CHADD.

Parker, H. (1988). *The Attention Deficit Disorder Workbook for Parents*, *Teachers and Kids*. Plantation, FL: Impact Publications.

Rief, S. (1993). *How To Reach and Teach Children with ADD/AD/HD*. West Nyack, NY: The Center for Applied Research in Education.

Organizations/Weblinks - National

ADHD.com
http://www.adhd.com/index.jsp

Attention Deficit Disorder Resources
http://www.addresources.org

Centers for Disease Control and Prevention (CDC)
Attention-Deficit/Hyperactivity Disorder
http://www.edc.gov/ncbddd/adhd

Children and Adults with Attention Deficit Disorders (CHADD)
8181 Professional Place, Suite 201 - Landover, MD 20785
National Call Center – 800-233-4050
http://www.chadd.org

PlanetPsych.com Online Therapist Directory/Virginia
http://www.planetpsych.com/zDirectory/virginia.htm

Organizations/Weblinks - Virginia

Children and Adults with Attention Deficit Disorders (CHADD)
Central Virginia Chapter
804-423-6332
http://www.ric-add.com/home.htm

CHADD of Northern Virginia
P.O. Box 2645 - Fairfax City, VA 22031
24-Hour Information Line - 703-641-5451

Tidewater CHADD
P. O. Box 62686 - Virginia Beach, VA 23466-2686
757-479-9993
http://www.tidewaterchadd.org

Parents Advocacy | ACT
142 W. York Street, Suite 710 - Norfolk, VA 23510
757-623-2228

Parents of Children with ADD and ADHD/Roanoke
6603 Sherry Road - Roanoke/Botetourt, VA 24019
Intake 540-366-2809

People with Attentional and Developmental Disabilities Association (PADDA)
813 Forrest Drive, Suite 3 - Newport News, VA 23606
757-591-9119